

CLAIMS

What is claimed is:

- 1 1. A method of patterning a recording medium comprising:
2 selectively thermally coupling said recording medium and a heat source to
3 alter a chemical composition of said recording medium.
- 1 2. The method according to claim 1, wherein said chemical composition is
2 altered according to a predetermined pattern.
- 1 3. The method according to claim 2, wherein said predetermined pattern
2 comprises one of concentric circles and parallel tracks.
- 1 4. The method according to claim 1, wherein altering said chemical
2 composition causes an altered magnetic order of said recording medium.
- 1 5. The method according to claim 1, wherein altering said chemical
2 composition causes an altered dielectric constant of said recording medium.
- 1 6. The method according to claim 5, wherein altering said dielectric
2 constant causes an altered reflectivity of said recording medium.
- 1 7. The method according to claim 1, wherein altering said chemical

2 composition causes an altered electrical conductivity of said recording medium.

1 8. The method according to claim 7, wherein altering said electrical
2 conductivity causes an altered electron transport property of said recording
3 medium.

1 9. The method according to claim 1, wherein altering said chemical
2 composition causes an altered thermal conductivity of said recording medium.

1 10. The method according to claim 1, further comprising:
2 depositing said recording medium on a substrate.

1 11. The method according to claim 1, wherein said selectively thermally
2 coupling comprises selectively directing an incident thermal wave from said heat
3 source to said recording medium to form a direct thermal coupling between said
4 heat source and said recording medium.

1 12. The method according to claim 1, wherein said medium comprises cobalt
2 and chromium.

1 13. The method according to claim 1, wherein said substrate comprises one of
2 glass, silicon, quartz, sapphire, AlMg and a ceramic substrate.

1 14. The method according to claim 1, wherein said heat source comprises one
2 of a near-field thermal probe and a nanoheater.

1 15. The method according to claim 1, wherein said heat source physically
2 contacts said recording medium.

1 16. The method according to claim 1, wherein said heat source is physically
2 separated from said recording medium.

1 17. The method according to claim 1, wherein said chemical composition is
2 altered by one of interfacial mixing, interfacial reactions, selective oxidation,
3 structural relaxation, phase segregation and phase change.

1 18. The method according to claim 1, wherein altering said chemical
2 composition transforms said medium from a paramagnetic medium to a
3 ferromagnetic medium.

1 19. The method according to claim 1, wherein altering said chemical
2 composition transforms said medium from a ferromagnetic medium to a
3 paramagnetic medium.

1 20. The method according to claim 1, wherein altering said chemical
2 composition alters a magnetic axis orientation of said medium.

1 21. The method according to claim 1, wherein altering said chemical
2 composition reduces at least one of magnetization and coercivity of said medium.

1 22. The method according to claim 1, wherein said selectively thermally
2 coupling comprises selective near-field radiative coupling of blackbody radiation
3 from said heat source to said recording medium.

1 23. The method according to claim 1, wherein said medium comprises
2 $\text{Co}_x\text{Cr}_{1-x}$, where x is in a range from 0.63 to 0.75.

1 24. The method according to claim 1, wherein thermal energy is transferred
2 to said medium by conductive heating.

1 25. The method according to claim 1, wherein thermal energy is transferred
2 to said medium by radiative heating.

1 26. An apparatus for patterning a recording medium, comprising:
2 a heat source for generating and directing an incident thermal wave to a
3 recording medium, said thermal wave altering a chemical composition of a

4 recording medium; and
5 a controller for coordinating a mutual position of said incident thermal
6 wave and said recording medium so as to thermally couple said heat source and
7 said recording medium.

1 27. The apparatus according to claim 26, wherein said heat source comprises:
2 a heating plate for developing a thermal energy field which couples said
3 heat source to said recording medium; and
4 a heat sink connected to said heating plate.

1 28. The apparatus according to claim 27, wherein said heating plate comprises
2 a tip for concentrating and directing a thermal energy.

1 29. The apparatus according to claim 27, further comprising:
2 an optical waveguide coupled to said heat sink, for carrying a focused laser
3 beam.

1 30. The apparatus according to claim 29, wherein said optical waveguide
2 comprises an optical fiber.

1 31. The apparatus according to claim 29, wherein said optical waveguide
2 comprises a planar optical waveguide.

1 32. The apparatus according to claim 27, further comprising:
2 a resistive heating element thermally coupled to said heat sink.

1 33. The apparatus according to claim 26, wherein said heat source comprises
2 an atomic force microscope probe.

1 34. The apparatus according to claim 26, wherein said heat source comprises
2 one of a nanoheater and a near-field thermal probe.

1 35. The apparatus according to claim 26, wherein said controller coordinates
2 said mutual position of said incident thermal wave and said recording medium to
3 induce a direct thermal coupling that subsumes at least one portion of a thermal
4 near-field.

1 36. A read/write head assembly, comprising:
2 a read/write head;
3 a heat source connected to said read/write head for generating and
4 directing an incident thermal wave to a recording medium, said thermal wave
5 altering a chemical composition of a recording medium; and
6 a controller for coordinating a mutual position of said incident thermal
7 wave and said recording medium so as to thermally couple said heat source and
8 said recording medium.

1 37. The read/write head assembly according to claim 36, wherein heat source
2 comprises one of a nanoheater and a near field thermal probe.

1 38. The read/write head assembly according to claim 36, wherein said
2 chemical composition is altered according to a predetermined pattern, and wherein
3 said heat source patterns said recording medium during a read/write operation of
4 said read/write head assembly.

1 39. A patterned recording medium, comprising:
2 a substrate; and
3 a single layer medium formed on said substrate having a portion which has
4 been patterned by altering a chemical composition of said medium using selective
5 thermal coupling.

1 40. A method for manufacturing a patterned magnetic disk, comprising:
2 depositing a recording medium on a substrate;
3 selectively thermally coupling said recording medium and a heat source so
4 as to alter a chemical composition of said recording medium, and
5 depositing a protective coating on said recording medium.

1 41. A programmable storage medium tangibly embodying a program of
2 machine-readable instructions executable by a digital processing apparatus to



- 3 perform a method for patterning a recording medium, said method comprising:
- 4 selectively thermally coupling said recording medium and a heat source to
- 5 alter a chemical composition of said recording medium.

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